

The Wayback Machine - [https://web.archive.org/web/20130515011939/http://wsyachina.narod.ru/history/50\\_mt\\_bomb.html](https://web.archive.org/web/20130515011939/http://wsyachina.narod.ru/history/50_mt_bomb.html)

[To the main page](#)

<a href="#">Physics</a>	<a href="#">Astronomy</a>	<a href="#">Earth Sciences</a>	<a href="#">Chemistry</a>
<a href="#">Technology</a>	<a href="#">Psychology</a>	<a href="#">Economy</a>	<a href="#">Miscellaneous</a>
<a href="#">Biology</a>	<a href="#">Medicine</a>	<a href="#">Story</a>	<a href="#">Social sciences</a>

V. B. Adamsky,  
Yu. N. Smirnov

## 50-megaton explosion over Novaya Zemlya

### *From the editors.*

*The creation of the Soviet super-powerful hydrogen bomb and its explosion on October 30, 1961 over Novaya Zemlya became an important stage in the history of nuclear weapons. V.B. Adamsky and Yu.N. Smirnov, who have repeatedly appeared on the pages of our magazine, together with A.D. Sakharov, Yu.N. Babayev and Yu.A. Trutnev were direct participants in the development of the design of this bomb. They also participated in its testing.*

*The memoirs of V.B. Adamsky and Yu.N. Smirnov are supplemented by the memoirs of A.D. Sakharov, published earlier. We consider this material unique and are glad that it appears for the first time on the pages of the VIET journal.*

On October 30, 1961, a telegram signed by the Minister of Medium Machine Building E.P. Slavsky and Marshal of the Soviet Union K.S. Moskalenko was sent to Moscow. The minister and the commander-in-chief of the country's missile forces reported on the testing of a Soviet thermonuclear bomb of unprecedented power:

"Moscow, Kremlin. To N.S. Khrushchev.

The test on Novaya Zemlya was successful. The safety of the testers and the nearby population is ensured. The testing ground and all participants have fulfilled the mission of the Motherland. We are returning to the congress" [1] .

In Moscow, in the huge Kremlin Palace of Congresses, which had just been built and opened its doors for the first time, the XXII Congress of the CPSU had been taking place for two weeks. October 30 was the penultimate day of its work.

On the morning of October 30, the delegates to the congress unanimously made a sensational decision: " *to recognize as inappropriate the further preservation of the sarcophagus with the coffin of I.V. Stalin in the Mausoleum...* " [2, v. 3, p. 122] .

And that same morning at 11:32 a.m. a bomb with a capacity of 50 million tons of TNT was detonated over Novaya Zemlya at an altitude of 4000 m above the land surface.

The flash of light was so bright that, despite the solid cloud cover, it was visible even at a distance of a thousand kilometers. The swirling giant mushroom grew to a height of 67 km. By the time of the explosion, while the bomb was slowly descending on a huge parachute from a height of 10,500 m to the calculated point of detonation, the Tu-95 carrier aircraft with the crew and its commander, Major Andrei Yegorovich Durnovtsev, was already in the safe zone. The commander returned to his airfield as a lieutenant colonel, Hero of the Soviet Union.

Slavsky and Moskalenko, being delegates to the congress, flew to the northern testing ground early in the morning on the day of the experiment to observe the preparation and execution of the explosion. From a distance of several hundred kilometers from the epicenter, while on board an Il-14 airplane , they saw a fantastic picture. The impression was completed by the shaking from the shock wave that overtook their airplane.

One of the groups of experiment participants saw not only a bright flash through protective dark glasses from a distance of 270 km from the explosion point, but even felt the impact of the light pulse. In an abandoned village - 400 km from the epicenter - wooden houses were destroyed, and stone houses lost their roofs, windows and doors.

For many hundreds of kilometers from the test site, the explosion changed the conditions for the passage of radio waves for almost an hour and stopped radio communication. The bomb creators and the leaders of the experiment, headed by the Chairman of the State Commission, Major General N.I. Pavlov, who were at the airfield on the Kola Peninsula near Olenya, had no clear idea for 40 minutes about what had happened and the condition of the crews of the carrier aircraft and the accompanying Tu-16 laboratory aircraft . And only when the first signs of radio communication with Novaya Zemlya appeared, the command post near Olenya requested information in plain text about the height of the cloud. In response, they reported: about 60 km. It became clear that the bomb design had not failed.

Meanwhile, the crews of the two planes flying out on the mission and the documentary filmmakers who were with them at other points experienced, by force of circumstances, the most vivid and powerful impressions. The cameramen recalled:

*„It's scary to fly, so to speak, astride a hydrogen bomb! What if it goes off? Although it's on safety catches, but still... Not a molecule will remain! There's unbridled power in it, and what power! The flight time to the target isn't very long, but it drags on... We're on a combat course. The bomb bay doors are open. Behind the silhouette of the bomb is a solid cotton wool of clouds... And the bomb? Are the safety catches off? Or will they be off during the drop? Drop! The bomb goes and drowns in the grey-white mess. The doors slam shut immediately. The pilots are moving away from the drop site on afterburner... Zero! Below the plane and somewhere in the distance, the clouds are illuminated by a powerful flash. What illumination! "Behind the hatch, light simply spread out – a sea, an ocean of light, and even the layers of clouds lit up, became visible... At that moment, our plane came out between two layers of cloudiness, and there, in that gap, from below, a huge, light-orange bubble appeared ! It, like Jupiter – powerful, confident, self-satisfied – slowly, silently crawled upward... Having torn apart the seemingly impenetrable cloudiness, it grew, kept getting larger. It seemed as if the whole Earth would be sucked in behind it, as if into a funnel. The spectacle was fantastic, unreal... in any case, unearthly " [3, pp. 117–127].*

Another cameraman saw " *a powerful white flash over the horizon, and after a long interval – a distant, dull, heavy blow – aaaahhh! As if the Earth had been killed!* " [ibid.] .

Then, some time after the explosion, they filmed the central area: " *The surface of the island was so melted, swept and licked that it became not a surface but a skating rink! And the rocks too, the snow had melted onto them, their edges and ribs were shining... There was no trace of any unevenness... We were filming directly from the air, flying around and hovering... Here is the epicenter. Thermonuclear raged above this point. Everything was swept away, licked, cleaned, everything was melted and blown through!* " [Ibid.] .

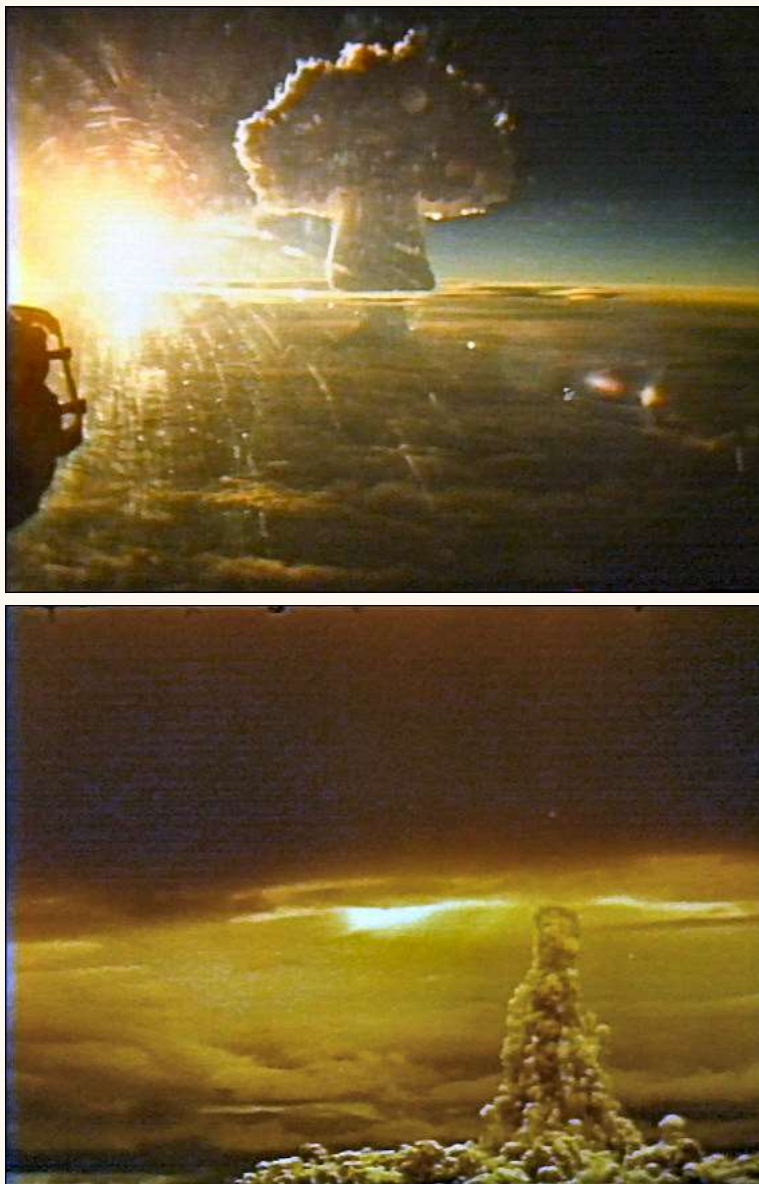
The 20-minute film about the creation of the 50-megaton bomb, its preparation and testing was later shown to the country's top leadership. The film concluded with the narration: " *Based on even the most preliminary data, it became obvious that the explosion produced was record-breaking in its power.* "

Indeed, its power was ten times greater than the combined power of all the explosives used by all the warring countries during all the years of World War II, including the American atomic explosions over the cities of Japan. It is difficult to imagine that, given the trend of world development, a more powerful explosion will ever be produced anywhere on Earth. Most likely, it is destined to remain unsurpassed in history forever.

The explosion stunned the world community at the time. And later it has often become the subject of discussions, legends and hoaxes. Including today. In the newspaper Izvestia, O. Suleimenov, referring to the explosion of a super-powerful hydrogen bomb, believed that " *this qualitative leap reduced to nothing the Americans' advantage in the number of tests* ", that Khrushchev went ahead with the signing of the Moscow Treaty on the Ban on Nuclear Weapons Tests in Three Environments, " *having a sixty-megaton in his arsenal* " [4] . In the TV film "The Tale of the Invisible City", which was aired at the end of 1992, an inaccurate thesis was also proclaimed: " *Only after this explosion did the parties make concessions and sign the Treaty...* " .



*Testing the most powerful thermonuclear bomb (50 Mt TE) . Tu-95 carrier aircraft , October 30, 1961. From top to bottom: aircraft takeoff, aircraft in flight, bomb release ( Minatom Archive )*



*Explosion of the most powerful thermonuclear bomb (two moments in time) . Novaya Zemlya test site, October 30, 1961. ( Minatom Archive )*

Due to the secrecy and limited information at the time, even some of the test managers had misconceptions. For example, the head of the test site on Novaya Zemlya, G.G. Kudryavtsev, let it slip during the superbomb test that in our country “ 60-megaton and even 100-megaton (fortunately , never tested) superbombs were born ,” and he explained their “appearance” in a rather peculiar way: “ *I think that the “secret” here is simple. The fact is that in those years our launch vehicles did not have the necessary accuracy in hitting the target. These shortcomings could only be compensated for in one way – by increasing the power of the charge* ” [1] .

And the completely fantastic idea about a 50-megaton bomb belongs to Pravda: “ *It is yesterday’s nuclear weapons. Now even more powerful charges have been created* ” [5] .

In fact, the 50-megaton bomb tested on October 30, 1961, was never a weapon. It was a single product, the design of which, when fully “loaded” with nuclear fuel (and while maintaining the same dimensions!) allowed for a yield of even 100 megatons. Therefore, the test of the 50-megaton bomb was a simultaneous test of the operability of the design of the 100-megaton product. An explosion of such terrifying power, if it had been carried out, would have instantly generated a gigantic fire tornado that would have engulfed an area close in area to, for example, the entire Vladimir region.

The explosion of the 50-megaton bomb did not, as some believe, lead to the immediate conclusion of the Moscow Treaty banning nuclear weapons tests in three environments. Negotiations on the conclusion of the Treaty continued for about two more years. Although, it must be assumed that, as a symbol of the dangerous and unrestrained nuclear race, it, albeit indirectly, contributed to the success of the negotiations. The Treaty was concluded on August 5, 1963. Long and complex diplomatic efforts led to the goal. And perhaps it is worth mentioning that during 1962 and 1963 the USA and the USSR conducted more than 180 nuclear weapons tests before the Moscow Treaty was signed [6, p. 57] .

The 50-megaton bomb had no military significance. It was a one-off demonstration of force, accompanying specific circumstances of the political kitchen, the "great game" of intimidation between the superpowers. This was the main purpose of the unprecedented test. Super-powerful charges are rejected by modern military doctrine. The thesis that we “ *have now created even more powerful charges* ” is simply absurd.

What were the peculiarities of the political situation? The warming of relations between the USSR and the USA that had begun, culminating in Khrushchev's visit to the United States of America in September 1959, was replaced within a few months by a sharp aggravation as a result of the scandalous story of the spy flight of F. Powers over the territory of the Soviet Union. The reconnaissance plane was shot down near Sverdlovsk on May 1, 1960. As a result, in May 1960, a meeting of the heads of government of the four powers in Paris was disrupted. The return visit of the US President D. Eisenhower to the USSR was cancelled. Passions flared up around Cuba, where F. Castro came to power. Moreover, the invasion of Cuban emigrants from the USA in the Playa Giron region in April 1961 and their defeat became a great shock. Awakened Africa was seething, clashing the



interests of the great powers. But the main confrontation between the USSR and the USA was in Europe: the difficult and seemingly insoluble issue of the German peace settlement, which focused on the status of West Berlin, periodically made itself felt. Exhaustive negotiations on mutual arms reductions, accompanied by tough demands from the Western powers for inspection and control in the territories of the negotiating parties, were unsuccessful. The negotiations of experts in Geneva on the ban on nuclear tests seemed increasingly bleak, although during 1959 and 1960 the nuclear powers (except France) observed the agreement on unilateral voluntary renunciation of tests of these weapons in connection with the aforementioned Geneva negotiations. Harsh propaganda rhetoric between the USSR and the USA became the norm, in which mutual accusations and outright threats were constant elements. Finally, the main event of that period was the construction of the infamous Berlin Wall overnight on August 13, 1961, which caused a storm of protests in the West.

Meanwhile, the Soviet Union was gaining more and more confidence in its own strength. It was the first to test an intercontinental ballistic missile and launch satellites into near-Earth space, made a pioneering breakthrough in man's space and created a powerful nuclear potential. The USSR, which enjoyed great prestige at the time, especially in the Third World, did not yield to Western pressure and itself moved to active actions.

Therefore, when passions became particularly heated towards the end of the summer of 1961, events began to develop according to a peculiar logic of force. On August 31, 1961, the Soviet government published a statement renouncing its voluntary commitment to refrain from testing nuclear weapons and deciding to resume these tests. It reflected the spirit and style of the time. In particular, it stated:

*“ The Soviet government would not have fulfilled its sacred duty to the peoples of its country, to the peoples of the socialist countries, to all peoples striving for a peaceful life, if, in the face of the threats and military preparations that have engulfed the United States and some other NATO countries, it had not used the opportunities available to it to improve the most effective types of weapons capable of cooling the hot heads in the capitals of some NATO powers ” [7]*

We, the developers of nuclear weapons, had already begun preparing for testing new models a month and a half before this statement. And we knew that the culmination of the series of tests planned in the USSR would be the explosion of a 50-megaton bomb, the design of which would, in principle, allow for an explosion of 100-megaton power. Several weeks before the explosion, in mid-July 1961, the theoretical development and justification of this design began, and some time later, its embodiment "in the material." A.D. Sakharov called the planned explosion "the highlight of the program."

The Soviet government made no secret of the planned super-explosion. On the contrary, it informed the world of the upcoming test and even (an unprecedented case in our practice!) made public the power of the bomb being created. It is clear that such an "information leak" met the goals of a power political game. But at the same time it put the creators of the new bomb in a difficult position: its possible "failure" for one reason or another had to be excluded. Moreover, the bomb explosion had to hit the "bull's eye": to ensure the "ordered" power of 50 million tons of TNT! Otherwise, instead of the planned political success, the Soviet leadership had to experience an undoubted and sensitive embarrassment. There is no need to talk about the experiences and worries of the developers.

The first mention of the upcoming grand explosion in the USSR appeared, as far as we know, on September 8, 1961, on the pages of the American newspaper The New York Times, which reproduced Khrushchev's words:

*“ Let those who dream of new aggression know that we will have a bomb equal in power to 100 million tons of trinitrotoluene, that we already have such a bomb and all that remains is for us to test the explosive device for it ” [8, pp. 45–46].*

Khrushchev himself said that he mentioned the planned (but not yet announced) test of this bomb to an American politician who came to see him with his adult daughter, and added that she, upon hearing about such an intention of the USSR, burst into tears [9, p. 72] .

But our compatriots learned about the planned experiment only on October 17, the first day of the XXII Congress of the CPSU, when Khrushchev, in his report, deviating from the text, declared:

*“ ...I want to say that our tests of new nuclear weapons are proceeding very successfully. We will soon complete these tests. Obviously, at the end of October. In conclusion, we will probably detonate a hydrogen bomb with a capacity of 50 million tons of TNT. (Applause.) We said that we have a bomb with 100 million tons of TNT. And that is true. But we will not detonate such a bomb, because if we detonate it even in the most remote places, we can still blow out our own windows. (Loud applause.) Therefore, we will abstain for now and will not detonate this bomb. But, by detonating the 50 millionth bomb, we will thereby test the device for detonating the 100 millionth bomb. However, as they said before, God grant that we never have to detonate these bombs over any territory. This is the greatest dream of our life! (Loud applause.) “*

And then he added, speaking about those who are working on improving nuclear weapons and missile technology:

*“ We are proud of these comrades, we pay tribute to them, we rejoice in their creative successes, which contribute to strengthening the defensive power of our Motherland, strengthening peace throughout the world. (Stormy applause.) ” [2, vol. 1, p. 55] .*

A powerful wave of protests swept across the world in connection with the announcement of the upcoming test.





*The most powerful Soviet thermonuclear charge. Tested on October 30, 1961 at partial power. Energy release 50 Mt TE . Nuclear Weapons Museum RFNC-VNIIEF . (Archive of Minatom)*

During these very days, the final work on creating an unprecedented bomb and sending it to the Kola Peninsula to the base of the carrier aircraft was being completed in Arzamas-16 . On October 24, the final report was completed, which included the proposed bomb design and its theoretical and computational justification. The provisions contained in it were the starting point for the bomb's design engineers and manufacturers. The authors of the report were A.D. Sakharov, V.B. Adamsky, Yu.N. Babayev, Yu.N. Smirnov, Yu.A. Trutnev.

Of course, the contents of the report cannot be made public. However, we note that at the end it was said: " *The successful result of testing this product opens up the possibility of constructing a product of practically unlimited power .*"

In parallel with the work on the bomb , the carrier aircraft was prepared for the combat mission and a special parachute system for the bomb was being developed. This system for the slow descent of a more than 20-ton bomb turned out to be unique, and the head of its development was awarded the Lenin Prize.

However, if the parachute system had failed during the experiment, the aircraft crews would not have been harmed: the bomb included a special mechanism that would only launch the detonation system if the aircraft had already reached a safe distance.

The Tu-95 strategic bomber , which was supposed to deliver the bomb to the target, underwent an unusual modification at the manufacturing plant . The completely non-standard bomb, about 8 m long and about 2 m in diameter, did not fit into the bomb bay of the plane. It was cut out and a special lifting mechanism and device for attaching the bomb were installed. And yet it was so large that more than half of it stuck out during flight. The entire body of the plane, even the blades of its propellers, were covered with a silver paint .

In Arzamas-16, the bomb was assembled in a workshop right on a special railway platform, which, when the work was completed, looked like an ordinary covered wagon. To do this, it was necessary to lay a railway line inside the workshop. In the twenties of October, the wagon with the bomb prepared for transportation, observing the strictest safety requirements, when any surprises are excluded, moved to its destination - Olenya station on the Kola Peninsula. A special train of several wagons, some of which covered a special wagon in front, and the rest in the back, under increased security, with a minimum of stops and with several redirections along the way so that the departure station could not be determined, reached the target in a very short time.

At the Olenya station, the unusual cargo was already awaited. The bomb was moved to a heavy-duty truck trailer and, under heavy guard, with cover vehicles in front and behind, was delivered to the airfield, to a special building. Each unit of the bomb and its automatic elements were subjected to careful technical control, after which it was brought into combat readiness.

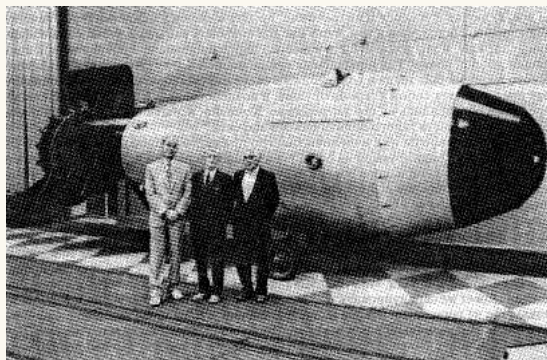
There were only a few hours left before the experiment. Now the day and hour of the explosion were determined by the weather and the wind direction over the Novaya Zemlya test site. The final word was left to the State Commission...

Each of us, naturally, has our own impressions of this unforgettable event. Andrei Dmitrievich told about it on the pages of his "Memoirs" [9, pp. 71–74]. We present the relevant excerpts as a single story. Then come our personal recollections, colored, of course, by individual experience and perception. We separate the author's texts with "asterisks."

\*\*\*

#### A. D. Sakharov:

Preparations for the tests were in full swing, and Yuli Borisovich [Khariton. — Auth.] made a brief announcement about it [in mid-August, in the Kremlin. — Auth.] . But Khrushchev already knew the main lines of the planned tests, in particular, about the record-breaking powerful device we had proposed for testing. I decided that this device would be tested in a "clean version" — with an artificially reduced power, but nevertheless significantly greater than that of any device previously tested by anyone . Even in this version, its power exceeded the Hiroshima bomb by several thousand times! Reducing the share of fission processes in the total



*The authors of the article V.B. Adamsky (right) and Yu.N. Smirnov (left) with the scientific director of Arzamas-16, Academician Yu.B. Khariton. In the background is a model of a 100-megaton thermonuclear bomb, tested in a half-power version on October 30, 1961. Nuclear Weapons Museum, Arzamas-16 , August 17, 1993. Photo by V.I. Lukyanov and S.A. Nazarkin.*

power reduced to a minimum the number of victims from radioactive fallout in the next generations, but victims from radioactive carbon, alas, remained, and their total number was colossal (over 5,000 years) ...

In early October I went to Moscow to discuss the calculations, especially the large product. I did not find Gelfand at the institute and went to his home. We discussed urgent plans for the calculations...

The most powerful product was the one that was causing me the most excitement... The last days before the "powerful" one was to be sent off were underway. A special room had been allocated for its assembly. The assembly was carried out right on the railway platform. In a few days, the wall of the workshop was to be dismantled, and the platform (as always, at night), attached to a special train, was to be sent under the green light to the point where the product would be loaded into the bomb bay of the carrier. One of my employees, Yevsey Rabinovich, came into my office. He smiled sheepishly and asked me to come into his workroom. All the employees of the department had already gathered there, including Adamsky and Feodoritov, who were "leading" the powerful product. (In A.D. Sakharov's "Memoirs," the name of V.P. Feodoritov as a direct participant in the development of a super-powerful device in 1961 is mentioned by mistake. In fact, earlier, together with G.A. Goncharov and A.D. Sakharov, he was a co-author of an information note on the possibility of creating super-powerful thermonuclear charges (see below).)

Rabinovich begins to lay out his ideas, according to which a powerful product should fail during testing. He had come to this conclusion several days ago and had just reported to the entire department except me, sowing the strongest doubts in most of them. I had worked with Rabinovich in the closest contact for more than seven years, and highly valued his sharp critical mind, great knowledge, experience, and intuition. Now, reporting for the second time, he was clear and categorical in his formulations. His fears seemed entirely justified.

I believed that Rabinovich's final conclusion was wrong. However, it was impossible to prove this with absolute certainty. We did not have precise mathematical methods suitable for this purpose (partly because, in an effort to create a product that would allow for a large increase in power, we deviated from our traditional schemes). Therefore, Adamsky, Feodoritov, and I, in objecting to Evsey, used estimates (as did he). But all our experience showed that estimates are a good thing, but subjective. Under the influence of emotions, it is quite possible to make a serious mistake with them. I decided to make some changes in the design of the product, making the calculations of those subtle processes that Evsey spoke about, apparently, more reliable. I immediately went to the design department. If the head of the design department, D.A. Fishman, who replaced Yuli Borisovich, did not say a word of reproach to me, it was only because the situation was too serious to say anything. The designers did not go home that day until they had handed over the drawings to the shop; the next day the changes were made. I also decided to inform the Ministry of the latest developments and wrote a report, composed, as it seemed to me, in very considered and cautious terms, containing, if possible, a description of the situation without evaluating it.

Two days later, an enraged Slavsky called me. He said, "Tomorrow, Malinovsky (the Minister of Defense) and I are supposed to fly out to the test site. So, should I cancel the test now?" I answered him, "The test should not be canceled. I did not write that in my report. I thought it necessary to inform you that this test contains new, potentially dangerous elements and that there is no unanimity among theorists in assessing its reliability."

Slavsky muttered something dissatisfied, but clearly calmed down and hung up. The tests of the powerful device took place on one of the last days of the sessions of the XXII Congress of the CPSU. Of course, this was not accidental, but was part of Khrushchev's psychological program. Before that, almost as many explosions of various significance were carried out at two testing sites (in Kazakhstan and Novaya Zemlya) as in all the previous tests. In addition, as far as I know, a purely military test was carried out in another place.

On the day of the "powerful" test, I was sitting in my office by the telephone, waiting for news from the test site. Early in the morning, Pavlov called and said that the carrier aircraft was already flying over the Barents Sea towards the test site. No one was able to work. Theoreticians were hanging around the corridor, coming in and out of my office. At 12 o'clock, Pavlov called. In a triumphant voice, he shouted: "There has been no communication with the test site and the aircraft for more than an hour! Congratulations on your victory!" The meaning of the phrase about communication was that a powerful explosion creates radio interference, throwing up a huge number of ionized particles. The duration of the communication disruption qualitatively characterizes the power of the explosion. Another half hour later, Pavlov reported that the height of the cloud was 60 kilometers ...

To finish with the topic of the "big" product, I will tell here a story that remained "on a conversational level" — although it happened somewhat later. But it is important for characterizing the psychological attitude that forced me to show initiative even in those issues that I was not formally obliged to deal with, and in general to work not out of fear, but out of conscience. This attitude continued to operate even when, on a number of issues, I increasingly deviated from the official line. Of course, at its basis lay a sense of the exceptional, decisive importance of our work for maintaining world balance within the framework of the concept of mutual intimidation (later they began to talk about the concept of mutually assured destruction).

After testing the "large" product, I was worried that there was no good carrier for it (bombers don't count, they are easy to shoot down) — that is, in a military sense, we were working in vain. I decided that such a carrier could be a large torpedo launched from a submarine. I fantasized about developing a ramjet water-steam nuclear jet engine for such a torpedo. The target of the attack from a distance of several hundred kilometers should be the enemy's ports. The war at sea is lost if the ports are destroyed — the sailors assure us of this. The hull of such a torpedo can be made very strong, it will not be afraid of mines and barrage nets. Of course, the destruction of ports — either by an above-water explosion of a torpedo with a 100-megaton charge "jumping" out of the water, or by an underwater explosion — is inevitably associated with very large human casualties.

One of the first people I discussed this project with was Rear Admiral F. Fomin (as in the text of the "Memoirs." In reality, Fomin's name was Pyotr Fomich. — Author's note) (in the past, a combat commander, I think, a Hero of the Soviet Union).

He was shocked by the "cannibalistic" nature of the project, and remarked to me that naval officers were accustomed to fighting an armed enemy in open combat, and that the very idea of such mass murder was disgusting to him. I was ashamed and never discussed my project with anyone again. I am writing about all this now without fear that anyone will seize upon these ideas — they are too fantastic, clearly require exorbitant expenses and the use of great scientific and technical potential for their implementation, and do not correspond to modern flexible military doctrines, in general, they are of little interest. It is especially important that, given the current level of technology, such a torpedo can easily be detected and destroyed en route (for example, with an atomic mine). The development of such a torpedo would inevitably be associated with radioactive contamination of the ocean, and therefore, for other reasons, it cannot be carried out secretly.

\* \* \*

#### V. B. Adamsky:

The history of the creation of a super-powerful hydrogen bomb dates back to 1956. It was then that A.P. Zavenyagin, who was once the Minister of Medium Machine Building, proposed creating a very powerful product, and our colleagues in the Urals were tasked with making it. Even the body of the future bomb was created. But at the end of 1956, Zavenyagin died, and work on the product ceased. N.I. Pavlov, who was the head of our main department at that time, once noted that with the death of A.P. Zavenyagin, his



idea died too. And in general, no one particularly liked it, it did not look attractive: simply, more "fuel" — a large, powerful bomb. I don't even know what Zavenyagin's political background was. Perhaps, a straightforward technical desire to "expand the scale." In a word, the body remained lying at the Ural facility until better times.

In the summer of 1961, the forgotten idea was revived under new conditions. If in Zavenyagin's time the creation of a super-powerful bomb seemed premature, and the solution to this problem was technically straightforward, now, taking into account the progress in our developments, the problem could be solved physically beautifully, on a completely different level.

In any case, in the summer of 1961, when I returned from vacation and met Andrei Dmitrievich in the corridor, he joyfully exclaimed: "Oh! You've arrived! Good. Come see me — we were just waiting for you here." And in the presence of Trutnev and Babayev, Andrei Dmitrievich told me about a new task — to develop and prepare a super-powerful product for testing the following autumn. Andrei Dmitrievich wanted me to take on this task. We remembered the case that had once been made and stored in the Urals and decided to "fit" the new product into its dimensions. One of our designers, S. Voronin, was sent to the Urals to get the finished case and documentation for it.

Initially, it was intended to test a low-power charge by filling the main mass of the working layer with an inert substance. The power in this version would be about 2.5 megatons.

When the case arrived, its very appearance gave me the idea to make the product full-scale in terms of power, and Andrey Dmitrievich supported this idea.

Meanwhile, the test was increasingly acquiring not only a technical but also a political character. The development and testing of the device coincided with the Berlin crisis and were aimed at demonstrating force in this turbulent period. At that time, all of us, including Andrei Dmitrievich, adhered to the naive patriotic point of view that we should have the most powerful, most effective charges, and this should be known to the "potential enemy", as well as to "people of good will". The so-called "people of good will" (this term from political jargon was then in use) had to feel what a terrible threat nuclear weapons represented and influence their governments so that they would agree to ban them. Of course, a test at a reduced power could not have such a political effect.

The very beginning of work on the product quickly showed that it would objectively be the most important in the series of our tests planned for the fall. The task was very responsible and labor-intensive due to the large volume of calculations. Therefore, it could not be entrusted to only one performer. In addition, Andrei Dmitrievich assigned me the dispatch functions for distributing machine time for all the products being developed at that time. This was very important, since it became possible to give priority attention to the calculations on the super-powerful bomb computer.

Together with Yu. Smirnov, we made calculations and "drew", as they say, with both hands. And one day I noticed one detail in our results that made me worry. It showed that the development of dynamic processes in the product may not guarantee success. We were very worried about this, but for now I decided not to worry the management. Soon, Yu. Trutnev also noticed this feature and reacted to it very emotionally. It was decided to tell Andrei Dmitrievich, especially since it was already closer to September. But Andrei Dmitrievich took our concerns calmly, even quite optimistically. Of course, we sorted it out, realized that certain circumstances should be taken into account, but nothing terrible was happening yet. It must be said that Andrei Dmitrievich paid special attention to the super-powerful product. In this regard, I recall the visit to our facility of Deputy Minister P.M. Zernov and Chief of the Main Directorate N.I. Pavlova, when work on the product was in full swing.

For some reason, A.D. Sakharov was absent from the meeting with the guests, and I had to tell them about the development of the super-powerful product. I led the conversation in such a way that Andrei Dmitrievich was supposed to be perceived by the audience as a co-author and executor on this topic. I even showed some document where he was a co-executor along with us. For Zernov and Pavlov, this looked somewhat unusual, because by that time the technology for developing new products had grown so much and at the same time simplified so much that work on them no longer required the obligatory participation of such high authorities as A.D. Sakharov. But Andrei Dmitrievich objectively paid so much attention to this product that his direct participation was a fact and added additional authority to the topic. That is how it was understood by the guests. By the way, when we included him as a co-author on the final report, the point was that Andrei Dmitrievich, in the autumn series of tests, was involved in the specific development of this very important product and another one, to which the management did not attach much importance, however.

Some experiments on the product, conducted on special sites, and the scale and dimensions of the product itself were impressive. When I once found myself in the workshop where it was being assembled, and a worker up to his chest was sitting inside the bomb and soldering something, I involuntarily compared it to a pilot in a fighter plane - the bomb was so unusually large. Its dimensions also amazed the imagination of the designers. Once, during a conversation with Fishman, the director of the experimental plant E.G. Shelaton even doubted whether he had enough "combustible" material. D.A. Fishman answered him: "Look better, scrape together the bins."

By this time, most charges were constructed using a well-proven standard design. Our charge could probably have been made using the same design. But this would have led to unnatural relationships between the component units. Therefore, our charge incorporated two new principles. It would be more correct to say that one of them had already been incorporated into the 20-megaton charge that G.E. Klinishev was leading and that was to be tested a week earlier. Now it seems that this principle was optional. The other was more significant. It was its application that, in the event of a successful test, opened up the possibility of creating charges of unlimited power.

We treated our work as very interesting and important. There was a feeling of some kind of "record-breaking", excitement and awareness of human power. We even said, argued (and with Andrey Dmitrievich too) half-jokingly, half-seriously, that such a super-powerful explosion could be used as a signal for communication with extraterrestrial civilizations...

The work on the product required a lot of effort and attention. There were many tense moments. But when the aforementioned new product, which had a similar principle as the solution, was successfully tested the day before, the excitement cooled down somewhat.

The extremely tense final stage associated with the creation of the super-bomb was coming to an end for the designers and manufacturers.

I remember how during this significant period I found myself in Fishman's office on some business, who, while fulfilling his duties, also remained in charge of the command that had left for the testing grounds. Just at that time, Yuli Borisovich called from the Semipalatinsk testing ground and, apparently, inquired about how things were going with the super-powerful charge. David Abramovich, with a sigh of obvious relief, answered: "Finally, this thing is 'sailing away' ...". After the explosion on October 30 and the return of the planes to the airfield, the Chairman of the State Commission N.I. Pavlov lined us, the four developers of the product (Andrei Dmitrievich remained at the facility), and the crews of the Tu-95 and Tu-16 planes, facing each other right there, near the planes, and gave a major patriotic speech in honor of the physicists and pilots, in praise of the successes of our country. It was all over. We were returning home.

\*\*\*



**Yu. N. Smirnov:**

The Soviet Union's 50-megaton hydrogen bomb test shook the imagination of its contemporaries. As the most powerful man-made explosion in human history, the experiment stirred up the world's political leaders.

The day before, on October 24, 1961, the New York Times reported that the White House believed that " *such an explosion would have no military value and would only result in widespread radioactive contamination* ." Two days later, the same newspaper informed its readers:

*" The Political Committee of the UN General Assembly, by 75 votes in favor, 10 against, with 1 abstention, called on the Soviet Union to abandon the test of a 50-megaton bomb. The Soviet bloc and Cuba voted against, Mali abstained... "*

But diplomatic and political pressure could no longer change anything - the "cold war" developed according to its own laws. Especially since the United States, back in the first half of the 1950s, without any torment, carried out several powerful thermonuclear explosions themselves (for example, on November 1, 1952, the "Mike" experiment with a capacity of 10 megatons and a series of experiments in 1954: March 1 "Bravo" - 14.8 megatons, March 27 "Romeo" - 11 megatons, May 5 "Yankee" - 13.5 megatons) [10, pp. 82, 86].

The official statements that followed the Soviet super-powerful explosion only confirmed that the political effect planned by the USSR leadership had been achieved. Thus, according to the New York Times of October 31, " *the White House characterized the test as a political move aimed at inciting fear and panic* ." And the Times newspaper on November 1 quoted the not at all "protocol" words of the Prime Minister of Japan Ikeda from his telegram-protest to N.S. Khrushchev: " *This test plunged me into a state of shock such as I have never experienced before* ."

Now these events are distant history. A reminder of the dangerous and absurd "heights" to which the confrontation between the two superpowers reached, from which it seemed there was no and would be no reasonable way out.

It is probably difficult for the new generation to feel and understand the full intensity of the irreconcilable passions that the world, divided into two warring camps, lived with at that time. Let us hope that this period is irrevocably a thing of the past. But even the emotionless lines of the Guinness Book of Records from year to year, from edition to edition, stubbornly remind us that yes, such a thing did happen: " *The most powerful thermonuclear device that passed the test had a yield equivalent to 57 megatons of TNT* (in reality, 50 megatons. – Yu. S.) . *It was detonated in the USSR on Novaya Zemlya at 8:33 am Greenwich Time on October 30, 1961. The blast wave circled the globe three times, the first time in 36 hours 27 minutes.* " [11, p. 198].

... The summer of 1961 brought a surprise. On July 10, Nikita Khrushchev held a meeting in the Kremlin with the developers and creators of Soviet nuclear weapons. He reported that the country's leadership, taking into account the developing international situation, had decided to unilaterally abandon the voluntary commitment not to conduct nuclear tests. Such tests would be conducted in the coming autumn, and the corresponding official statement would be made by the government the day before. Until that moment, all work on preparing for the explosions had to be carried out in conditions of complete secrecy.

Returning from the meeting, Andrei Dmitrievich told us about the government's decision. He shared his impressions of the meeting in the Kremlin and added that a decision had also been made to develop and test a super-powerful 100-megaton bomb. Naturally, we were excited by the news. During the discussion, a pointed question was asked: " *Why is it necessary to make such a "cannibalistic" weapon?!* " Andrei Dmitrievich smiled: " *Nikita Sergeevich said - let this product hang over the capitalists like the sword of Damocles...* ".

For us theoretical physicists, and especially for newcomers like me, this turn of events was somewhat of a surprise. It was necessary to immediately begin intensive work. The intensity of the impression was increased by the fact that after a long break from testing, some of the experienced employees had the opportunity to experimentally test a number of new ideas and improvements, while some of the newcomers were about to come into contact for the first time with a real matter that was unprecedented for them. We were excited by yet another sharp turn in "grand politics" and found ourselves privy to a "surprise" of a global nature that was being prepared. (The Soviet government issued a statement renouncing the voluntary moratorium only on August 31, 1961. The very next day, the first explosion of our nuclear tests, unprecedented in quantity and variety of charges, thundered over the Semipalatinsk test site.)

Using A.D. Sakharov's term, "leading" the super-powerful device was entrusted to one of the most experienced employees - Viktor Borisovich Adamsky. The most authoritative employees of Andrei Dmitrievich - Yuri Nikolaevich Babayev and Yuri Alekseevich Trutnev - became direct participants in its development. Unexpectedly for me, I was also involved in the work on the super-bomb. I explain this primarily by the extraordinary trust with which newcomers were treated in the very small teams of theoretical physicists led by A.D. Sakharov and Ya.B. Zeldovich. I experienced this immediately, from the first months of work at the facility. This story is unforgettable.

Together with my classmate A. Rasskazov, we were given the task of preparing a review report for Yu. B. Khariton on the underground nuclear explosion that had taken place in the USA. It seemed that the completed report would "go on its own" to Yuli Borisovich, or, at worst, he would call us to his office. After all, everyone understood how busy he was. But something unexpected happened. Yuli Borisovich came specially to our building and, having settled in A. D. Sakharov's office, held a very detailed conversation with us about the report. He left only when complete clarity had been achieved on all the issues discussed...

At first it seemed to me that the 100-megaton device would hardly be tested, and for the time being the work on it did not acquire much intensity. The monstrous figure of power was overwhelming and was not perceived as something real and acceptable. But gradually the discussions around this bomb became more definite. Soon it was decided to test it in a half-power version. Everything changed quickly. It became clear that from an outsider, as it seemed to me in the first days, this test was moving into the category of priority and most responsible. The superbomb really turned out to be on a special account with Khrushchev, a kind of trump card in his political game with America. For this reason alone, it was never some kind of "labor gift" from the developers of nuclear weapons for the opening of the next party congress, as they write in some publications (see, for example, [12, p. 99]).

The development of the superbomb began to receive increased attention and maximum, comprehensive assistance. Andrei Dmitrievich took this work under his wing.

During this period, the employees of the theoretical sectors were captivated by the prospects that had opened up as a result of the fundamental achievements of our physicists during the nuclear weapons tests in 1955 and 1958. (Many people now know about the implementation of the so-called "third idea" in 1955. But another important result was obtained in one of the experiments in 1958 and is associated with the names of Yu. N. Babayev and Yu. A. Trutnev.) This success had a huge influence on all subsequent work on Soviet thermonuclear charges, predetermining the initial concepts for the super-powerful bomb.

It so happened that after Andrei Dmitrievich gave me the task of developing a 100-megaton bomb, my stitched, sealed, top-secret workbook was at hand. Adamsky and Trutnev quickly sketched out a basic sketch diagram of the product on one of its pages before my eyes - in essence, it was brought to life.

From that moment until the explosion of the device, Viktor Borisovich and I were inseparable at work. More and more often and longer we sat in his small room, doing calculations, until finally we began to stay until deep twilight. This work brought us closer, preserving the warmth of our relations for all the following years.

Andrei Dmitrievich began to drop in on us more and more often. He would sit down on a chair, sometimes, to my surprise, deftly wrapping one leg around the other. During these moments of communication and discussion of results, the boundaries of position and age were erased. We were so carried away (and there was less and less time left!) that when, during some passionate discussion, Yakov B. Zeldovich dropped in on us and tried to "get" Andrei Dmitrievich, he stood up, went up to Yakov Borisovich and, in a friendly, very gentle manner, escorted him out of the room.

The tension was growing. Sometimes doubts arose involuntarily: would the product fail, would it "fail" during testing. Once Andrei Dmitrievich remarked: "*If we don't do THIS, we'll go and build railroads...*" Another time, at the final stage of the work, when protests against the super-powerful explosion already announced by Khrushchev began to spread abroad, he reasoned quite calmly that, although two or three of our embassies in Western countries might have their windows broken after our experiment, things would not go further than that.

We not only carried out numerous calculations on the computer and made rough estimates when changing the parameters, trying to understand the physical picture of the phenomena during the "detonation" of the bomb and trying to make sure of the effectiveness of the emerging design. We went to the designers for consultations and to coordinate technical documentation, and visited the experimenters when conducting some model experiments.

The work was in full swing. New parts and components of the future bomb were constantly appearing at the plant. Naturally, many different specialists were involved in its creation.

The tension reached its peak when the device was sent to the testing area. Then, on October 26, 1961, Adamsky and I were supposed to leave by train for the place where the final preparation of the bomb and its suspension in the bomb bay of the carrier aircraft was to take place. We agreed that Babayev and Trutnev would catch up with us by plane in Moscow the next day, and, having united, we would go together by train to Olenya station.

Time was compressed. On the day of departure, I bumped into Andrei Dmitrievich on the stairs and asked him to sign my travel assignment. He signed it right there, without going up to his office. Taking advantage of the informality of the situation, I asked him why he signed so amusingly, from a distance crossing out the stick in the letter "h" in his last name (later he simplified his signature as much as possible). Andrei Dmitrievich answered: "*I have a sign: if you manage to cross out the stick in the middle, everything will be fine. If not, expect complications.*" And he added, pleased: "*See how well it turned out this time: it means the product will work successfully!*"

That same day, October 26, towards evening, when V.B. Adamsky and I had already taken our seats in the train car and were preparing to leave for Moscow, Yu.N. Babayev and Yu.A. Trutnev suddenly appeared in our compartment. They said that they had arrived at the train together with Andrei Dmitrievich and that he was waiting for us in the car. We got out of the train car. Not far from the platform there was a Volga. We all sat down together, and an unusual, but very important and urgent business meeting began. It was dictated by a combination of circumstances and, above all, by Khrushchev's preemptive statement at the opening of the CPSU Congress about the upcoming test, indicating not only the timing, but also the power of the product. Such a step was unprecedented. In combination with the technical nuances that worried us, this gave rise to natural anxiety and caused additional tension.

Andrei Dmitrievich also shared fresh information, apparently coming from the highest authorities. It also concerned the testing of our product. As far as I remember, the conversation was, in particular, about some kind of politicking among the top generals in this difficult situation.

In essence, we were faced with a dramatic question: should we cancel the test itself in the current situation? The opinions of the participants in this impromptu meeting were heard. No one was in a hurry. Viktor Borisovich, with his characteristic calm, was unperturbed this time too: "*I am confident in the reliability of the product. Everything is reliable...*"

Meanwhile, the train was standing. Our meeting was ending. It was decided not to change anything. Andrei Dmitrievich wished us success and said that he would remain at the facility. Viktor Borisovich and I returned to the carriage, and the train started moving. The modest building of the facility station slowly floated before our eyes...

On the evening of October 28, while on the train, we heard Khrushchev's voice on the train broadcast, speaking at the congress with his closing remarks and saying, as if for us:

*„Lately, bourgeois propaganda has been making a lot of noise about the fact that the Soviet Union was forced to resume nuclear weapons testing. This noise took on a hysterical character after the upcoming nuclear weapons test with a capacity of 50 million tons of TNT was announced at the congress. Voices are being raised that these tests are contrary to moral principles. Strange logic! When the United States of America was the first to create an atomic bomb, they considered it legally and morally justified to drop it on the defenseless inhabitants of Hiroshima and Nagasaki. It was an act of senseless cruelty, there was no military necessity for it... ” [2, v. 2, pp. 571–573].*

Viktor Borisovich and I left the compartment and went into the corridor. The train was racing. Khrushchev's voice, rising to a high pitch, could be heard throughout the entire carriage through the clatter of the wheels. Several people were listening to the broadcast, standing next to us. They were talking and commenting... Of course, we could not show that we had a direct relation to the topic of the speech and the upcoming explosion. Khrushchev continued: "*By strengthening the defense of the Soviet Union, we are acting not only in our own interests, but also in the interests of all peace-loving peoples, of all humanity. When the enemies of peace threaten us with force, they must and will be countered with force, and more impressive force at that...*" [ibid.] .

The congress delegates burst into thunderous applause. It was clear that our product had no right to fail...

We arrived at Olenya station early in the cold morning. A Volga car was waiting for us. Having overcome the dreary, bare space, we very soon found ourselves in a closed military town at the airfield. The four of us were placed together in one spacious room on the second floor of some building and "put on rations" in the officers' mess. (I, a recent student, was especially impressed by the fact that at the first request the waitress girl with a sweet smile brought any extra food from the kitchen.)

Having barely recovered from the journey, we drove to a specially guarded impressive technical building, which was located at some distance from the runway. In one of its rooms, Major General N. I. Pavlov, the head of one of the main departments of our ministry, and here the chairman of the State Commission for Conducting Nuclear Weapons Tests on Novaya Zemlya, was already working with documents. He was assisted by the good-natured and funny Kolya Samokhvalov, our colleague from Ya. B. Zeldovich's group. After a short, lively conversation, which was more reminiscent of a mutual friendly greeting, we, dressed in snow-white robes, went into a special large room where "our" bomb was located.



Around her, several people in the same snow-white robes were “conjuring” as they carried out a series of final operations. It was quiet, a calm businesslike atmosphere reigned. Individual clear words could be clearly heard. Nothing and no one could distract the people working here from their work. Such was the established order.

In this regard, the episode connected with the registration of my permanent pass to the technical building, where I was admitted for the first time with the permission of N. I. Pavlov, is typical. No one sent me to the photographer, I did not have to go or go anywhere. After some time, the “special photographer”, apparently photographing “for history” the preparation of products for testing, came up to me, and we “for a second” went into the next room. He placed me by the whitewashed wall, and I lowered my robe from my shoulders. The shutter clicked, and I returned to my comrades. And soon they brought me a fully completed pass with a pasted-on photograph...

On the evening of October 29, in a large room on the first floor of the building where we were staying, behind a door guarded by a sentry, a meeting of the State Commission was held. Among those present, three men in general's uniforms stood out: the imposing Lieutenant General S. V. Forsten, the very stately and military-style handsome Major General N. I. Sazhin, and, of course, the chairman, Nikolai Ivanovich Pavlov, whose appearance, voice, and even manners reminded me of the then popular film actor Nikolai Kryuchkov.

The heads of various services and departments reported briefly on their complete readiness for the experiment. The weather forecast was also favorable. It was decided to test the super-powerful bomb on October 30, 1961.

After the commission meeting, I went with a group of officers to a special auditorium to watch training “silent” documentaries intended for the crews of combat aircraft. There were flashes of footage showing how a bomb is dropped over a testing ground, how the crew prepares for a nuclear explosion, and how a giant mushroom cloud forms in the atmosphere. But I was especially impressed by the footage from inside the aircraft cabin: a flash of light and a strong shaking from the shock wave generated by the explosion, and then from the wave reflected from the surface of the Earth. I involuntarily imagined then what kind of test and what emotional stress awaited the pilots during the explosion of “our” superbomb...

Late at night, in the first hours of the new day, October 30, I went to the technical building again with Babayev. Then we approached the plane that was supposed to deliver the superbomb to the target. People were scurrying around the huge machine under local camouflage lighting, preparing it for the most important flight. After some time, a tractor with a special cart on which the bomb rested slowly emerged from the darkness. The soldiers guarding the plane were joined by security guards accompanying the bomb.

By 9 a.m. all the preparatory operations and the bomb suspension were completed. The crew members climbed into the plane one after another through the hatch under the fuselage. A long, tedious wait began. Finally, the command was given to begin the mission.

We moved to the side of the runway. At some distance from us, two or three documentary cameramen were setting up their cameras.

And then the engines roared. The Tu-95 strategic bomber, with a bomb sticking out of the bomb bay, slowly and carefully headed towards the distant starting point of the airfield, where the Tu-16 laboratory aircraft was already located. A mighty roar was heard, and the Tu-95, having taken off heavily along the seemingly endless concrete strip, and behind it the Tu-16, rose into the grey, low sky covered with solid clouds. We were told that soon the aircraft heading for Novaya Zemlya would be joined by escort fighters. We again found ourselves in the grip of anticipation...

Several people had gathered in the room where the State Commission had met the day before. We were exchanging humorous remarks. But it seemed that everyone was overcome by poorly concealed tension. From time to time, news came in that the connection with the pilots was normal and everything was going according to schedule. The critical minute was approaching... A message came through that at the designated point the bomb had separated from the plane, the parachute had opened, and the crews were leaving the area of the upcoming explosion...

Finally, we were informed that at 11:33 Moscow time, communication with the crews and observation points for the experiment was completely lost. This meant that the explosion had taken place. Now we had to find out how the crews were feeling and to what extent the characteristics of the explosion corresponded to its calculated parameters. Only 40 minutes later did the first news arrive that the planes were safely returning to their airfield and that, according to preliminary data, the thermonuclear charge had worked normally. This news dampened our worries and dispelled our anxiety. The first congratulations were heard.

After some time, N.I. Pavlov invited us, four developers, with him, and we went to meet the landing planes.

The planes taxied. It was clear that in one or two places on the Tu-95 there were small dark marks from the light flash of the explosion. When the noise of the engines died down and the crews were on the ground, the bomber commander A.E. Durnovtsev reported to the Chairman of the State Commission on the successful completion of the mission. Questions and answers began. One of the crew members, a very young man who was in the tail cockpit of the bomber and who, like no one else, saw the panorama and dynamics of the development of the unprecedented “mushroom”, showed Pavlov the characteristic stages of this process that he had sketched. An unforgettable finale to the meeting was Nikolai Ivanovich's short but vivid congratulatory speech, which he addressed to the pilots and to us, physicists...

A few hours after the test, Andrei Dmitrievich called us, and we congratulated each other on the success. In this conversation, Viktor Borisovich said: “Courage takes the city!” Andrei Dmitrievich answered laconically: “I understand you.” The conversation was about the high level of tension and risk at the final stage of the work. The culmination of our state was, perhaps, the memorable meeting in the car before the train's departure. We learned that the bomb had demonstrated a design capacity of 50 megatons and, therefore, had worked perfectly from Yu. B. Khariton, who called us that same day from the Semipalatinsk test site.

I heard the details from Yuliy Borisovich quite recently:

*“At that time, I was preparing a large number of tests at the Semipalatinsk test site. I received the necessary information about the progress of preparations for testing the super-powerful device. I remember the day of the tests very well. It was known in advance exactly when and at what hour the explosion would occur, and seismic equipment was installed in the underground room of the Semipalatinsk test site. Some time before the explosion, a small group, including me, went down to the basement, and after the moment when the explosion over Novaya Zemlya was supposed to take place, the equipment was turned on. Estimates of the possible seismic signal were made in advance, according to which it was possible to judge the power of the explosion. From what we saw on the seismograph after some time, it was possible to conclude that the power of the explosion, as planned, was about 50 million tons of TNT equivalent. I reported this to the members of the group creating the super-powerful device and impatiently awaiting the test results. Further measurements confirmed this figure. Thus, the Soviet Union found itself in possession of the most powerful nuclear device in the world, a more powerful one than which was never produced again.”*

Several years ago I also spoke with N.I. Pavlov about this unique explosion. He called it an epochal event...



Soon after the explosion, we started packing up to go home. The authorities were kind, and I received permission to spend a few days at my own discretion. Early in the morning of November 4, at my request, I was taken to Monchegorsk, which seemed like a very small town to me, and from there I took a train to Murmansk. I wandered around the streets, looked at the ocean ships, went into the local history museum, where many exhibits reminded me of Academician A.E. Fersman. I even managed to see a film. Then I got on a plane and arrived in Leningrad almost after midnight. Here I spent a few days with my university friends and discovered that all they talked about was our super explosion. It turned out that they had heard about everything on foreign radio and retold numerous comments and reports. And I pretended that I knew nothing about this event.

When I returned home to the facility on November 10, I was surprised to learn that my senior colleagues were also in Leningrad. But they were delayed because Viktor Borisovich had fallen ill. Time was running out, and Andrei Dmitrievich asked me to prepare a final report on the results of testing the super-powerful product. The work was done, and I went to see him. Andrei Dmitrievich began to carefully read the handwritten text, page by page. Suddenly, the local telephone rang. Answering someone's questions, he said that he had been awarded the title Hero of Socialist Labor twice - in 1953 and 1956, after testing thermonuclear weapons. I realized that a presentation was being prepared to award Andrei Dmitrievich a third Gold Star of the Hero. Having finished reading my draft and without making a single correction to the text, Andrei Dmitrievich thought about it. Then, at the end, I added a short sentence repeating one of the theses of our final report: *"The successful test of the charge... proved the possibility of constructing charges of practically unlimited power on this principle."*

And he gave the go-ahead for further processing of the manuscript.

Well, how the awarding of the third Hero star to A.D. Sakharov took place was told by N.S. Khrushchev's son, Sergei Khrushchev, who, according to him, was accidentally present at the moment when his father was informed about the prepared lists for the award, and all that was left was to obtain consent to issue the decree in the Presidium of the Supreme Soviet of the USSR:

*"It turned out that Sakharov's name was missing — he had not taken an active part and, moreover, had spoken out against the test. My father was indignant. And he thundered that this was an outrage! Sakharov's contribution to our defense was enormous. They may have different points of view, but each one was doing his job. They were like leaders of the state, and he was like a scientist. It's good that they were arguing, expressing and discussing different points of view and approaches. This was a chance to make fewer mistakes. They did not agree with Sakharov, did not listen to him, especially since his award would testify to the government's respect for his point of view... Thus, Andrei Dmitrievich Sakharov became a three-time Hero of Socialist Labor"* [13, pp. 341–342].

(In 1961, A.D. Sakharov did not speak out against a specific test. He was very actively involved (when the decision was made) in the creation of a super-powerful bomb. In reality, Sakharov objected to Khrushchev on July 10, 1961, believing that the voluntary commitment to refrain from testing nuclear weapons, which was in effect at the time, should not be violated. — Author's note.)

... The work on the 50-megaton bomb was exciting. The upcoming test was the center of attention of the country's leaders. That is why the entire chain of events made an unforgettable impression on me, then a very young 24-year-old man: from the first mention of the task to develop such a bomb, from the first numerical estimates that fit on several pages, to its material embodiment at the plant and suspension in the bomb bay of the aircraft, from the stage of our professional work on the bomb, to the final moment, when only the country's top leaders could influence the course of events.

In this regard, two episodes are characteristic. I remember an incident when I, alone, without my senior experienced colleagues, under some circumstances found myself at the plant, in a special room where the charge elements were located. There, without any allowance for my "green" age, they turned to me and asked whether it was possible to do this or whether it was acceptable to do otherwise, whether it would affect the performance of the charge. And another picture. A cart with "our" powerful bomb, accompanied by security, approached the bomb bay of a huge plane. We, its developers, having now turned into passive spectators, silently watched the precise, coordinated actions of the specialists. We understood that it, even before it was activated, had already excited and somehow "crushed" the world with the magic of its existence and the inevitability of the approaching explosion. A few hours later, standing at the side of the airfield runway, we watched a bomber fly past us, with a familiar body visible under its fuselage...

And then - an explosion that shook the whole world...

Now, the days and nights spent in Olenya are reminded to me by the officer's golden chest badge, which I bought then as a souvenir in the military store of the airfield garrison: a small bomb with a scarlet star on the stabilizer, the same scarlet number "1" along the body and wings symmetrically spread out to the sides of the body, as is customary in aviation symbols. Apparently, I bought the badge of a first-class bomb-throwing pilot. But at that time I liked to perceive it in a completely different way: as a symbol of our top-secret small "bomb-throwing" collective, led by A.D. Sakharov and called "sector - 1". Later, however, the badge became a reminder, rather, of the superbomb itself. And it, in turn, disturbs the memory with very difficult questions ... Actually, the questions began to appear soon after the explosion. The first one is - what next?... The next one is - why?...

Of course, working on the bomb was an all-consuming task. Naturally, I had never encountered anything like it before. The excitement of youth and, in a certain sense, a kind of "baptism of fire" only increased the acuteness of the perception of what was happening. Everything else retreated, faded and was incomparable with the main thing. Close interaction with colleagues - bright and extraordinary people, their trust and disposition added to my confidence in my abilities. Communication with Andrei Dmitrievich, which at first seemed fantastic, became the norm. And each new meeting with him and discussion of the results evoked more and more respect for this extraordinary person.

At that moment, I was not bothered by any "tricky" questions or doubts. The general atmosphere of professional search and enthusiasm was captivating and seemed completely natural. After all, at that time, the simple word "must" was capacious and meaningful for us. Our work was the embodiment of efforts to "do everything" in the interests of the country's security. In addition, of course, the young man could not help but be flattered by his involvement in a matter of national importance, which was under the control of the country's leadership and which later resonated throughout the world. In that period of reckless enthusiasm, I had no room for questions...

They, growing and increasingly subjugating, emerged later. But this is a topic for a separate conversation...

In conclusion, I will dwell on a specific fact, which, I believe, shows a very peculiar interweaving of the interests of the country's defense with the absurd logic of the nuclear race, when militaristic frenzy dominates morality.

A.D. Sakharov actively participated in the work on the superbomb. Moreover, after its testing, he, on his own initiative, began to look for a way to effectively deliver a super-powerful charge to the target, settling on a large torpedo launched from a submarine. This was his answer to the question "what next?" However, Andrei Dmitrievich's enthusiasm quickly faded after a conversation with Admiral Fomin: *"I was ashamed and never discussed my project with anyone again."* And this was the answer to the second question. But this multifaceted, thought-provoking collision had an unexpected continuation. Although without the participation of Andrei Dmitrievich and, certainly, without his knowledge.

One day in October 1993, I accidentally heard on Radio Liberty a speech by N.N. Suntsov, former head of the Department of Surface Phenomena of Underwater Nuclear Explosions of the Leningrad Marine Branch of the Central Research Institute-12 of the Ministry of Defense. Nikolai Nikolaevich reported that in 1962, in place of the highly dubious option of a large torpedo, “*an option appeared in which the explosion should occur at some distance from the shore.*” And this explosion — naturally, of a super-powerful charge — was supposed to lead to the emergence of a gigantic catastrophic wave of the tsunami type.

**Suntsov** then said:

*"In 1962, I was summoned from Leningrad to Moscow by the head of the 6th Directorate of the Navy, engineer-vice-admiral Fomin Petr Fomich. He was a prominent figure among the leadership of the Navy: all naval nuclear weapons were under his control, and the nuclear testing ground on Novaya Zemlya was subordinated to him. Fomin summoned me to entrust me with the execution of research work, as he said, of extreme importance. The purpose of this work was to develop a method for calculating the damage that could be caused to the territory of the United States by an artificial tsunami wave caused by an underwater explosion of a powerful thermonuclear charge. A range of TNT equivalents was issued, the upper limit of which was the figure of 100 megatons. My attempts to assert that this undertaking would not lead to a strategic effect aroused Fomin's anger. "It was said that I don't understand anything, that this idea belongs to Academician Lavrentiev. He, Academician Lavrentiev, believes that a wave of the "tsunami" type from a powerful underwater thermonuclear explosion could cause significant damage to a large part of the territory of the USA. And Lavrentiev has already written a report on this matter to Khrushchev. Nikita Sergeyevich became interested and ordered to look into it and report... After all, this was the time of the Cuban Missile Crisis, and the world was on the brink of a global thermonuclear catastrophe. Using a 100-megaton thermonuclear charge in these conditions was very tempting. And if we also take into account Academician Lavrentiev's report and Khrushchev's reaction to it, then the matter was very, very serious..."*

It turned out that to achieve the desired effect, the explosion of a 100-megaton charge would have to be carried out at a depth of at least 1000 m. Then, at a distance of 5 km from the epicenter of the explosion, the height of the resulting ocean wave could be about 500 m, and its length would be close to 10 km. But for the mountainous Pacific coast of the USA, such a wave would not pose a great danger. Another matter is the Atlantic coast of America, which is distinguished, however, by an extensive coastal shoal. This would force them to go further into the ocean in search of suitable depths for the explosion. In addition, it was not entirely clear how the artificial wave would behave in the case of such a wide shoal. In this regard, Suntsov's team carried out extensive modeling studies.

On the sandy shore of Lake Ladoga near Priozersk, even a continental shelf and the adjacent part of the Atlantic Ocean off the east coast of the United States were modeled. Small charges of up to 100 kg thundered. Later, control experiments were conducted on Novaya Zemlya with a mass of conventional explosives of up to 1 ton. As a result, skeptical assumptions were confirmed that the continental shelf is an excellent filter that destroys the surf flow, and (regardless of the power of the underwater superexplosion in the ocean depths) real damage could be caused to structures and objects at a distance of 2, maximum 5 km from the water's edge.

Not without irony, Suntsov concluded:

*"Thus, we refuted the proposal of some hotheads to "wash" American imperialism off the face of the Earth with a 100-megaton charge. This closed the issue, and, as far as I know, it was never returned to."*

Interest in the thermonuclear supercharge tested as an aerial bomb as a possible weapon option was lost. But, having become a symbol of the confrontation between the two nuclear superpowers, this test continues to excite the imagination of journalists and historians.

\* \* \*

The test of a 50-megaton charge was a milestone in the development of nuclear weapons. This test clearly demonstrated the global nature of the impact of a powerful nuclear explosion on the Earth's atmosphere, including such factors as a sharp increase in the background tritium in the atmosphere, a 40-50 minute interruption of radio communications in the Arctic, and a shock wave that spread over hundreds of kilometers. The test of the charge design confirmed the possibility of creating a charge of any, arbitrarily large power.

Participation in the development of a super-powerful charge was a special milestone in the biography of A.D. Sakharov. This was the last product that he worked on with great intensity, seriously and without any hesitation. He accepted the proposal to make this charge full-scale in power and test it.

It might seem that his interested work on a monstrous bomb casts a shadow on his humanistic aspirations. It is no coincidence that N.I. Pavlov once even joked about this: "*The pacifist has cracked...*".

But one cannot ignore that an explosion of such incredible power made it possible to show the all-destructiveness and inhumanity of the weapons of mass destruction that had been created, which had reached the apogee of their development. Humanity and politicians had to realize that in the event of a tragic miscalculation there would be no winners. No matter how sophisticated the enemy was, the other side would have a crushing response.

The created charge simultaneously demonstrated the power of man: the explosion in its power was a phenomenon of almost cosmic scale. It was not without reason that Andrei Dmitrievich sought a worthy application for the charge. He proposed using super-powerful explosions to prevent catastrophic earthquakes [14, p. 120], to create unprecedented in energy nuclear particle accelerators for the purpose of penetrating into the depths of matter [15], to control the movement of cosmic bodies in near-Earth space in the interests of man [16].

Hypothetically, the need for such a charge may arise if it is necessary to deflect the trajectory of a large meteorite or some other celestial body under threat of its collision with our planet. Before the creation of high-power nuclear charges and reliable means of their delivery, which have now also been developed, humanity was defenseless in such a situation, although unlikely, but still possible.

In the 50-megaton charge, 97% of the power was due to thermonuclear energy, i.e. the charge was distinguished by high "purity" and, accordingly, a minimum of fission fragments, which create an unfavorable radiation background in the atmosphere. Thanks to this, our American colleagues understood that our scientists are also concerned with minimizing the radiation consequences of testing their own nuclear weapons and thereby reducing the radiation impact on living and future generations.

After the explosion of the Soviet superbomb, American experts immediately noted and appreciated the advantages of its design. According to the famous atomic scientist Ralph Lapp, in the United States it was believed that the Soviet "*explosion at an altitude of only 4,000 meters would cause a very significant fallout of radioactive fallout. But the Russians surprised Western experts. When scientists in the United States analyzed samples of the explosion products of this bomb (sampling was carried out by an airplane at high altitude), they established: 1) the bomb was enclosed in a lead shell and 2) less than 2 percent of the explosion energy came from the fission reaction, and the rest of the energy came from the fusion reaction. Consequently, it was an extremely "clean" bomb,*

*the explosion of which caused a relatively weak fallout of radioactive fallout... The Soviet tests demonstrated what the nuclear experts of the United States clearly understood: the thermonuclear bomb is a weapon whose improvement has great prospects, that is, it is possible to create a thermonuclear bomb of any size and with relatively little additional cost" [8, pp. 46–47].*

The explosion on October 30, 1961 was the first pre-announced test in the USSR, when the expected power figure was named. This imposed a special responsibility on the developers, since a failure or a serious reduction in power would have been a blow to the authority of our scientists.

Naturally, our colleagues from the theoretical departments of A.D. Sakharov and Ya.B. Zeldovich provided great assistance in choosing the design of the super-powerful charge and its justification.

As early as May 1960, in connection with the fact that the foreign press had started to discuss the possibility of creating a superhydrogen bomb with a capacity of 1000 megatons, A.D. Sakharov, G.A. Goncharov and V.P. Feodoritov assessed the feasibility and main parameters of similar and even more powerful designs. A brief, 2-3 page, informational reference was prepared. At the same time, G.A. Goncharov and V.P. Feodoritov provided a possible diagram of such charges. The 50-megaton bomb that was created and tested on October 30, 1961, was made according to the same basic diagram.

When working on the product, the entire arsenal of theoretical methods that had been developed by that time and had proven themselves was used. But the task also required unusual approaches. Thus, V.G. Zagrafov proposed and applied an original method for calculating the chain reaction. A serious problem arose when calculating the time factors that guaranteed the operation of the product with the specified power of 50 megatons - a problem that was successfully solved by L.I. Ognev, N.B. Lavrovskaya and A.I. Kitserov.

The enormous power (the largest among the tests conducted both in our country and in the USA ) should have caused and did cause alarm throughout the world: nuclear weapons threaten the future of humanity. An understanding arose that these weapons should be taken under international control, the forms of which, although not yet found, must be sought and implemented. Indeed, not immediately, but gradually a number of agreements were concluded to limit tests and nuclear weapons.

Of course, the world community and the governments of world powers came to the need for such agreements as a result of understanding the consequences of many tests, including the unprecedented test of October 30, 1961.

## Literature

1. Trud. 1991. May 23.
2. XXII Congress of the Communist Party of the Soviet Union. Verbatim report: In 3 volumes. Moscow, 1962.
3. *Suvorov V.A.* Strana Limoniya. Moscow, 1989.
4. Izvestia. 1990. October 13,
5. Pravda. 1992. October 20.
6. Science and Life. 1990. No. 9.
7. Pravda. 1961. August 31.
8. *Lapp R.* Murder and Super-Murder. Moscow, 1964.
9. *Sakharov A.D.* Memories // Znaniya. 1990. | 12.
10. *York H.F.* The Advisors. Stanford, California, 1976.
11. Guinness Book of Records, 1993. Moscow-London, 1993.
12. Novaya Zemlya / Responsible and ed. P. V. Boyarsky. Moscow, 1993. Vol. 1. Book 1.
13. *Khrushchev S. N.* Pensioner of Union Significance. Moscow, 1991.
14. Nature. 1990. No. 8.
15. Pravda. 1966. May 20.
16. *Sakharov A. D.* Anxiety and Hope. Moscow, 1990.

## About the authors:

**Viktor Borisovich Adamsky** (born 1923) is a participant in the Great Patriotic War. From 1950, he was an employee of the theoretical sectors in Arzamas-16 , headed by Ya.B. Zeldovich and A.D. Sakharov. When by 1963 the negotiations between the USSR, USA and England on banning nuclear weapons tests had reached an impasse, V.B. Adamsky made an important constructive proposal, which, thanks to the efforts of A.D. Sakharov and E.P. Slavsky, became known to N.S. Khrushchev and very quickly led to the signing of the Treaty Banning Nuclear Tests in Three Environments.

**Yuri Nikolaevich Smirnov** (born 1937) from 1960 to 1963 was an employee of the theoretical sector in Arzamas-16 , headed by A.D. Sakharov and engaged in the development and improvement of thermonuclear weapons. He then took direct part in the Soviet program for the use of underground nuclear explosions for peaceful purposes. Currently, he is a leading researcher at the Russian Scientific Center "Kurchatov Institute". He is the author of several important publications on the history of the Soviet atomic project.

## "Questions of the History of Natural Science and Technology"

[www.nsu.ru](http://www.nsu.ru)

Articles on similar topics:

[On the creation of the Soviet hydrogen \(thermonuclear\) bomb.](#) Yu. B. Khariton, V. B. Adamsky, Yu. N. Smirnov.

[The main events in the history of the hydrogen bomb in the USSR and the USA.](#) G. A. Goncharov.

[On the history of the Soviet hydrogen bomb.](#) G. A. Goncharov.

[Episodes in the birth of the "sloika".](#) V. I. Ritus.

[Super-powerful nuclear explosions in the USA and the USSR.](#) V. B. Adamsky, Yu. N. Smirnov, Yu. A. Trutnev.

50-megaton explosion over Novaya Zemlya. V. B. Adamsky, Yu. N. Smirnov.

[Memories of participants in the development and testing of the Superbomb.](#)

[Taming the core. \(chapters from the book\)](#) I. A. Andryushin, A. K. Chernyshev, Yu. A. Yudin.

[White Archipelago. \(chapters from the book\)](#) Vladimir Gubarev.

[Nuclear tests of the USSR \(chapters from the book\).](#)

[About creation of the first domestic atomic bomb.](#) G. A. Goncharov, L. D. Ryabev.

[How the atomic problem was solved in our country.](#) M. G. Pervukhin.

[The weapon that has exhausted itself.](#) L. P. Feoktistov.



[Preparation of the test site and testing of the nuclear bomb.](#) V. N. Mikhailov, E. A. Negin, G. A. Tsytkov.  
["RDS-1" - Chronicle of the first test.](#) from the report of K. I. Shcheyolkin.  
[Test sites, test sites...](#) E. V. Vagin.  
[Semipalatinsk nuclear test site.](#) V. N. Mikhailov.  
[Birth of the test site.](#) P. Veltitsky.  
[Creation of the test site on Novaya Zemlya.](#) E. A. Shitikov.  
[Test site activities on the Novaya Zemlya archipelago.](#)  
[An atomic bomb in a torpedo tube.](#) E. A. Shitikov.  
[Testing of ships at the Novaya Zemlya test site.](#) E. A. Shitikov.  
[Live fire with nuclear explosions.](#) E. A. Shitikov.  
[Nuclear test site on Novaya Zemlya.](#) V. N. Mikhailov.  
[Memories of Novaya Zemlya.](#) G. G. Kudryavtsev.  
[Twice on Novaya Zemlya.](#) V. M. Kiselev.  
[Emergency situations.](#) E. M. Lomovtsev.  
[Thirty days on the destroyer Ostorozhny off the coast of Novaya Zemlya.](#) Garnov V. V.  
[The work of testers is never easy and safe.](#) G. A. Kaurov.  
[Megaton "secret".](#) G. A. Kaurov.  
[Test work on the Shumny glacier.](#) V. I. Lepsky.  
[Underwater nuclear explosions.](#) B. D. Khristoforov.  
[Safety zone.](#) Mikhail Vazhnov.  
[The lost world of Khariton. Memories.](#) L. V. Altshuler.  
[Nuclear weapons museum.](#)  
[Four plus four.](#) Viktor Malkov.  
[This is how they began to split the nucleus.](#) Vladimir Gubarev.  
[Uranium-45.](#) I.S. Drovnenikov, S.V. Romanov.  
[Top Secret Mission.](#) Boris Ioffe.  
[The Main Facility of the State](#) Vladimir Gubarev  
[Over the Nuclear Abyss](#) Vladimir Gubarev  
[The Heat of Nuclear Fire](#) Vladimir Gubarev  
[Academician Yuri Trutnev: "An Endless Front of Work".](#) Vladimir Gubarev.  
[From the Plow to the Nuclear Club.](#) Vladimir Gubarev.  
[Arkady Brish: "We Have No Right to Make a Mistake".](#) Vladimir Gubarev.  
[The Idea Has Not Exhausted Itself.](#) A.A. Brish.  
[The Institute of Atomic Energy and Its Founding Fathers.](#) I. Larin.

---

[Physics](#) [Astronomy](#) [Earth Sciences](#) [Chemistry](#)  
[Biology](#) [Medicine](#) [History](#) [Social Sciences](#)  
[Technology](#) [Psychology](#) [Economics](#) [Miscellaneous](#)  
[Home](#)

